PATENT SPECIFICATION

658,129

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COMPLETE SPECIFICATION

Improvements in or relating to Apparatus for Spraying Fluids

I, JOE NYE WELCH, of 139, Plimpton Street, Walpole, Massachusetts, United States of America, a citizen of the United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to spraying apparatus for the discharge of liquid or gaseous fluids. While of general utility the apparatus according to the invention is particularly useful in paper making and in machinery for liberating, treating and handling textile and other fibres, and in general for washing, cleaning, flushing and like treatment of drums, screws, moulds, cylinders, rolls and of various chambers, containers and the like, especially where space limitations are an important consideration.

The invention provides a shower-pipe unit for fibre-handling, paper-making and other machines, comprising an elongated tubular body closed at one end and adapted for attachment to a support at the other end and, when so attached, to be closed at that other end, said body having an inlet for fluid to be sprayed, a plurality of discharge nozzles spaced along the body and communicating with the interior thereof, an oscillating discharge member in each nozzle, an operating rod housed in the body and connected to the discharge members, and an actuator member projecting from the body for moving the rod longitudinally to and fro to impart oscillating movement to the discharge members in the nozzles and thereby to spray fluid supplied to the body through the inlet.

In the accompanying drawing illustrating, by way of example, one spraying apparatus according to the invention:

Fig. 1 is a longitudinal sectional view, partly diagrammatic, of a shower-pipe unit of the apparatus,

Fig. 2 is a longitudinal section of a nozzle for the unit of Fig. 1, on a larger scale, and

Fig. 3 is a plan of the nozzle of Fig. 2, looking at the discharge end.

The apparatus according to the invention includes one or more units such as that of Fig. 1. This unit comprises a hollow cylindrical pipe 5 of any length appropriate for the particular installation, as indicated by the intermediate broken-away portion in Fig. 1. The pipe 5, which is preferably made of corrosion-resistant material, for example bronze, is supported in operative position by an end coupling 7 threaded to one end of the pipe at 6.

The coupling collar 7 adapts the shower unit for mounting on the appropriate supporting part 8, that shown somewhat diagrammatically in Fig. 1 being representative of any part available for the purpose at the particular installation. The selected part 8 is generally, but not necessarily, stationary. It may for example be a portion of, or a bracket or like part attached to, the frame of a paper-making or fibre-handling machine, a head or spider of a drum, a wall of a chamber from which an accumulation of fibres or other matter is to be released, and corresponding parts for apparatus of the particular industry concerned. For illustration the pipe 5 is shown disposed horizontally, but the entire unit is adapted for operation at any attitude with respect to the horizontal.

In the present example the coupling collar 7 is formed with a flange 9 bolted in fluid-tight relation to the supporting part 8. Since the shower-pipe 5 and associated parts may be supported at but one end, the unit may readily be introduced into more or less closed or restricted spaces. The fluid to be sprayed or diffused may be admitted directly to the pipe 5 at any convenient point along it or via the mounting collar 7. As shown in Fig. 1 the latter has a fluid inlet 10 threaded to a fluid supply conduit 11. The end 12 of the shower pipe 5 remote from the supporting end 6 is closed and sealed by a threaded cap 13.

An important feature of the invention is the construction and arrangement of the shower unit so that the pipe 5 itself constitutes the main housing, guide and support for the unit, is also the conduit for the fluid supply from the inlet 10 and in addition forms the tubular spray head proper from which the shower jet or spray discharge takes place at one or more discharge nozzles

as will later be described. This contrasts with known apparatus requiring two or more pipes in general parallelism and either laterally spaced or concentric. In the unit of the invention the single pipe 5 serves the plural functions of housing, support, guide, supply conduit and discharge head.

The cylindrical wall of the pipe 5 is apertured to accommodate a multiplicity of discharge means in the form of nozzles designated generally at 15, 15 in Fig. 1, one of the nozzles being shown separately in Figs. 2 and 3. These nozzles 15 are distributed along the pipe 5 in any desired spacing and arrangement usually including one or more longitudinal rows.

Referring more particularly to Figs. 2 and 3, each nozzle 15 comprises a cup-like tubular body or nozzle proper 16 including at the inner end a threaded nipple 17 for reception in a corresponding aperture in the wall of the pipe 5. The outer end of the nozzle body 16 has a central outlet opening 18, which is conically flared as shown, to provide for the desired angular range of the spray or jet, generally 10° to 20° or more about the central axis of the nozzle. Centrally within the body 16 is a chamber 19 circular in cross-section, or substantially so, as seen dotted in Fig. 3. This chamber provides a bearing guide for a movable ball discharge member 30.

The wall of the chamber 19 has an annular recess, in which is accommodated a removable snap ring 20, Fig. 2. This ring forms a retaining abutment for the discharge member 30 and provides a seat for it when the fluid flow is shut off. The outer end of the chamber 19 is provided with a low-friction bearing and packing 22 for the discharge member 30. This packing is constituted by a grommet or bearing washer having a central aperture of the same bore as that of the inner end of the outlet 18 of the nozzle, and is dimensioned to seat snugly within the end of the chamber 19. The inner face of this bearing and packing 22 is inwardly flared as indicated in Fig. 2 to provide a part-spherical bearing and sealing seat for the discharge member 30. The packing 22 may be of rubber or a rubber-like material.

Thus the nozzle body 16, ring 20 and packing 22 provide an outwardly sealed cage and universal guide-bearing for the discharge member 30 now to be described. The discharge member 30 is capable of oscillation in a plane generally longitudinal of the pipe 5. It is also universally adjustable with respect to the axis of the nozzle 16 so that the plane of oscillation may be angularly adjusted about the pipe axis. It is for this reason that the discharge member 30 is of ball form. It is proportioned to have a movable bearing fit in the chamber 19 where it is operatively located and guided by the chamber wall and the concave packing 22, and at times by the ring abutment 20.

The ball 30 has at the outer segment a discharge orifice 32 of desired size and shape and which communicates with a diametral passage 33 in the ball. A fluid-admitting channel 34 extends between the passage 33 and an inlet 35 in the lower segment of the ball 30. A radial stem 37 is threaded into a tapped recess 38 at the centre of the lower portion of the ball. To facilitate manufacture the diametral passage 33 is formed as a non-threaded continuation of the stem-attaching recess 38. The channel 34 is angularly offset from the passage 33 as shown. The stem 37 projects through the open end of the nozzle-supporting nipple 17 and carries an operating finger 40, integral with or fixed to the stem.

The unit includes means for oscillating the discharge members 30 during operation of the apparatus. In the illustrated embodiment the means for this purpose is constructed and arranged and so related to the discharge jet or spray means proper as to impose a minimum load and so reduce power consumption to a minimum.

Referring to Fig. 1, the operating fingers 40 of all the discharge members are operatively associated with a connector, constituted by a rod 45 extending longitudinally within the pipe 5. Opposite each nozzle 15, the rod 45 has provision for demountable connection with the corresponding operating finger 40. Each such connection, as shown, comprises a diametral recess 46 through the rod 45 and tapered inward from both ends thereof. The recess portion of minimum diameter forms an annular fulcrum 47 for pivotal and sliding association with the corresponding finger 40. The fingers 40 are proportioned to fit removably in the fulcrum seats 47 with a minimum of lost motion.

In assembling the unit, and assuming that the rod 45 is in the neutral or longitudinally central position as shown, the finger 40 of each nozzle 15 is inserted at the nozzle-mounting aperture of the pipe 5 and pushed through the corresponding opposite connection recess 46 in the rod 45. Since the fingers 40 are free to rotate in the connecting recesses 46, the nozzles 15 may readily be screwed into the installed position of Fig. 1, from which they are readily demountable, each as a unit, for cleaning and replacement or substitution.

The rod 45 is supported by a pair of opposed bellows 50 and 51 of similar size and capacity, one at each end of the rod and in mutual alignment in the pipe 5. The

opposed inner end walls 52, 53 of the bellows have internal axial bosses 54, 55 centrally tapped at the outer ends for threaded connection with the corresponding ends of the rod 45 at 56, 57. The outer end walls 58, 59 of the two bellows are formed at their outer faces with central supporting bosses 60, 61. The boss 61 for the bellows 51 is threaded and sealed in a corresponding tapped aperture in the end closure cap 13. An air duct 63 extends through the boss 61 and the end wall 59 of the bellows 51, providing communication between the interior thereof and atmosphere. The mounting boss 60 for the bellows 50 is tubular and is extended in sealing relation through, and projects beyond, the pipe supporting part 8. This tubular boss 60 is externally threaded to receive an anchor nut 64 at the outer face of the part 8, which part also may have threaded engagement with the boss.

The bellows 50 has associated with it an actuating rod 70, the inner end of which is threaded at 71 to the inner end of the boss 54 on the inner end wall 52 of the bellows 50. This actuating rod 70 extends through the outer end wall 58 of the bellows 50 and axially through the tubular boss 60 with capacity for axial sliding movement in relation to said parts as bearings. Communication between the interior of the bellows 50 and atmosphere is provided in any convenient manner as by an air duct 74 in the rod 70.

The outer end of the rod 70 is operatively associated with a power-operated motor, oscillator, reciprocating part or other actuator for imparting oscillatory movement to the rod. This actuator is indicated diagrammatically at M in Fig. 1 and, if hydraulic, may derive energy from or be operatively subject to the pressure of the fluid to be sprayed.

It will be understood that the entire interior of the pipe 5 is uniformly subject to the pressure of the water, air or other fluid to be sprayed, coming from the supply line 11 and entering at the inlet 10. The aligned pairs of bellows 50, 51 operate in balanced opposition. Thus, in the central or neutral position of the parts shown in full lines in Fig. 1, the fluid pressure at the inner face of one of the bellows balances that in the opposite direction at the other bellows. Hence there is substantially no load effective in either direction with respect to the actuating rod 70. The latter accordingly is readily subject to reciprocating movement with minimum effort from the actuator M. During operation of the apparatus, oscillation imparted by the actuator M to the actuator rod 70 periodically shifts to and fro the actuator rod 70, the connector rod 45, the fingers 40 and the discharge members 50. The extent of axial reciprocating travel of the rod 45 and hence the angular movement of the several discharge members 30 and also the timing thereof, whether at regular intervals or otherwise, may be regulated and controlled at the actuator M. Travel toward the right in Fig. 1, as indicated by the right-hand dotted positions of the fingers 40, compresses the bellows 51 and correspondingly extends the opposite bellows 50, maintaining a balance of forces upon the movable parts, exclusive of that imparted by the actuating rod 70. A like but reverse balancing action attends the travel towards the left. The result is a sweeping movement of the jet or spray discharge from the nozzles 15 alternately in opposite directions lengthwise of the unit.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A shower-pipe unit for fibre-handling, paper-making and other machines, comprising an elongated tubular body closed at one end and adapted for attachment to a support at the other end and, when so attached, to be closed at that other end, said body having an inlet for fluid to be sprayed, a plurality of discharge nozzles spaced along the body and communicating with the interior thereof, an oscillating discharge member in each nozzle, an operating rod housed in the body and connected to the discharge members, and an actuator member projecting from the body for moving the rod longitudinally to and fro to impart oscillating movement to the discharge members in the nozzles, and thereby to spray the fluid supplied to the body through the inlet.

2. A shower-pipe unit as claimed in Claim 1, comprising a pair of opposed balancing bellows mounted in axial alignment with the operating rod and having their outer ends fixed and their inner ends connected to opposite ends of the operating rod.

3. A shower-pipe unit as claimed in Claim 1 or Claim 2, in which each discharge nozzle comprises a tubular body having therein a chamber with centrally open inner and outer ends, and wherein each discharge member is constituted by a ball mounted for guided movement in the chamber of the associated nozzle and carrying an operating finger projecting through the inlet end of the chamber and connected to the operating rod.

4. A shower-pipe unit as claimed in Claim 3, wherein the chamber in the tubular body of each discharge nozzle is cylindrical and has a flared outlet at its outer end, said tubular body being adapted at its inner end for attachment to the elongated tubular body

of the shower-pipe, the ball presenting a substantial segment at the chamber outlet, having a radial passage communicating with a discharge orifice in said segment at the chamber outlet, and an inlet duct leading to the radial passage from an inlet to the portion of the ball facing the inlet end of the chamber, and retaining means being provided between the ball and the inlet end of the chamber.

5. A shower-pipe unit as claimed in Claim 4, wherein the retaining means for the ball of each nozzle is a snap ring removably seated in an annular recess in the chamber.

6. A shower-pipe unit as claimed in Claim 4 or Claim 5, including an inwardly flared packing and bearing held in the chamber of each nozzle between the ball and the chamber outlet.

7. A shower-pipe as claimed in any of Claims 4—6, in which the operating finger of each ball is disposed in diametral alignment with the discharge orifice and with the radial passage, and in which the inlet duct is angularly offset from the radial passage.

8. A shower-pipe unit substantially as described herein with reference to the accompanying drawing.

Dated this 10th day of May, 1949.

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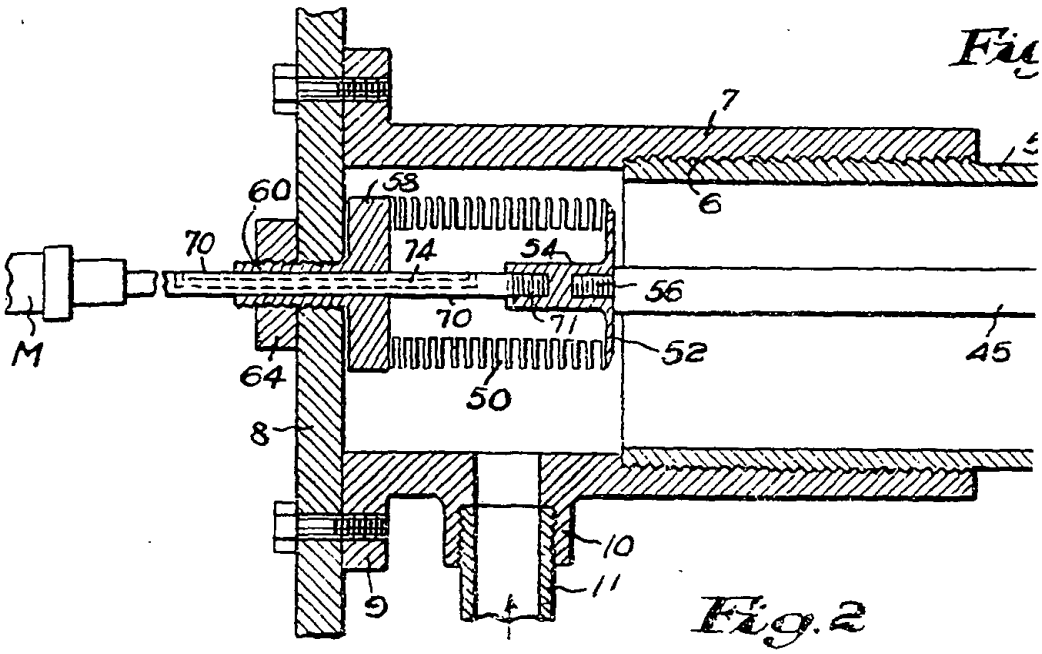

Fig. 2

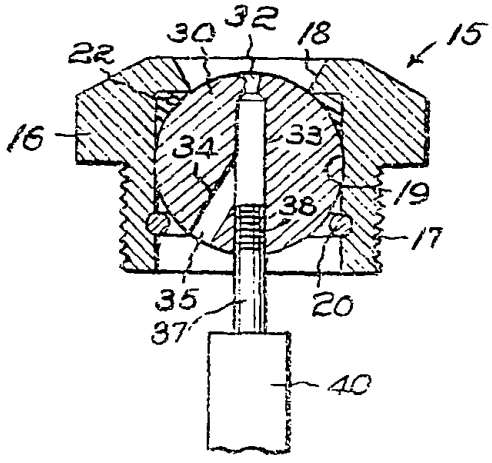

Fig. 1.

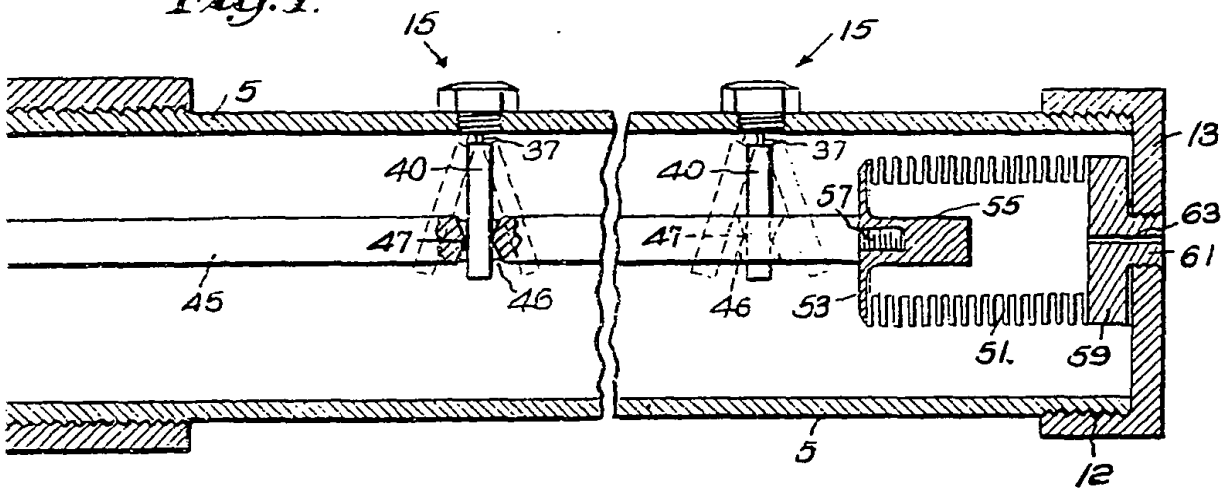
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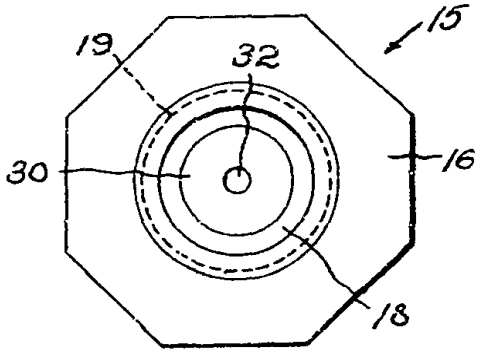
Fig. 3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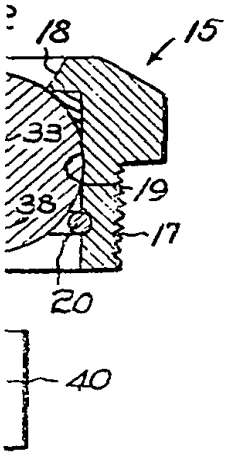
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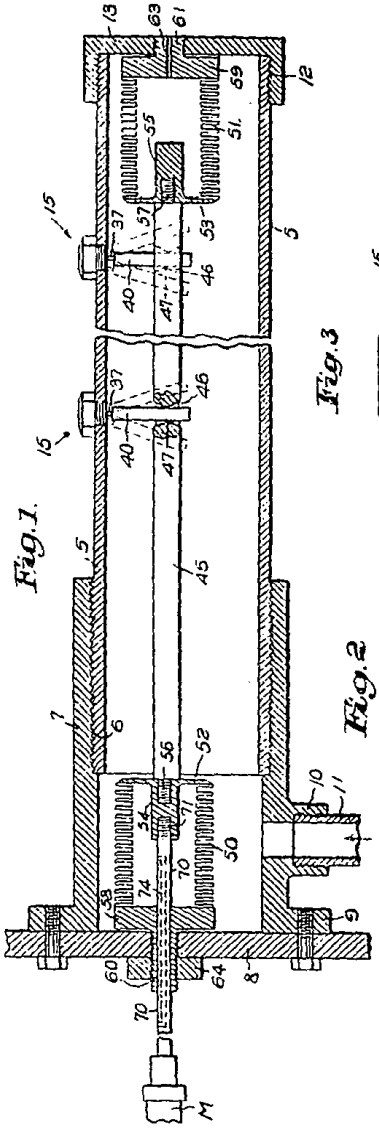

Fig. 1.

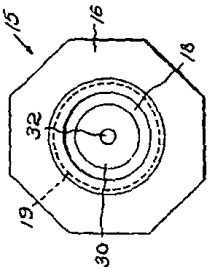

Fig. 3.

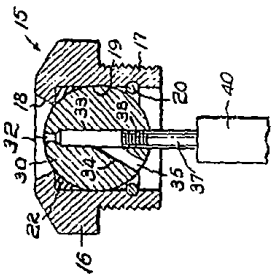

Fig. 2.

H.M.S.O. (M.F.P.)